

County of San Bernardino  
Department of Behavioral Health

**Heat Wave Plan/Procedures**

September 2007



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**1. DEFINITION: A *heat wave* is defined as three consecutive days (or more) of triple digit (100 degrees or higher) weather.**

Heat waves have claimed more lives over the past fifteen years than all other declared disaster events combined. For example, the 1989 Loma Prieta earthquake resulted in 63 deaths, while the 1992 Northridge earthquake was responsible for the loss of 55 lives. The catastrophic 2003 Southern California Firestorms resulted in 24 deaths. The worst single heat wave event in California occurred in Southern California in 1955, when an eight-day heat wave resulted in 946 deaths.

Typical summer temperatures in California contribute to the untimely demise of 20 people on average per year. The July 2006 Heat Wave in California has been the attributable cause of the death of 138 people over a 13-day period. San Bernardino County documented 10 deaths in 2006.

The following chart shows the health risks as temperature and relative humidity rise:

**Chart #1**

<i><b>The Heat Index</b></i>													
<b>Air Temp (° F)</b>	<b>Relative Humidity</b>												
	<b>40</b>	<b>45</b>	<b>50</b>	<b>55</b>	<b>60</b>	<b>65</b>	<b>70</b>	<b>75</b>	<b>80</b>	<b>85</b>	<b>90</b>	<b>95</b>	<b>100</b>
<b>110 °</b>	136	143	152										
<b>105°</b>	123	129	135	141	148								
<b>100°</b>	111	115	119	124	129	135	141	147					
<b>95°</b>	101	104	107	110	114	117	122	126	131	136	141		
<b>90°</b>	92	94	96	98	100	103	106	109	112	115	119	127	132
<b>85°</b>	84	85	86	88	89	91	93	95	97	99	102	104	107
<b>80°</b>	80	80	81	81	82	82	83	84	84	85	86	86	87
<i><b>Exposure to full sunshine can increase Heat Index values by up to 15° F.</b></i>													

## Chart #2

Heat Index	Category	Possible heat disorders for people in high risk groups
130°F or higher	Extreme Danger	Heatstroke risk extremely high with continued exposure.
105° - 129°F	Danger	Sunstroke, Heat Cramps and Heat Exhaustion likely, Heatstroke possible with prolonged exposure and/or physical activity.
90° - 105°F	Extreme Caution	<i>Sunstroke, Heat Cramps and Heat Exhaustion possible with prolonged exposure and/or physical activity.</i>
80° - 90 °F	Caution	Fatigue possible with prolonged exposure and/or physical activity.

## 2. ACTIONS REQUIRED DURING PHASE 3 HEAT WAVE ALERT

### a. SBC DBH Director:

- I) Notify the DBH Disaster Coordinator when a Stage 3 Heat Wave notification or activation has been received.
- II) Give approval to activate the DBH Heat Wave Plan.
- III) Authorize DBH Disaster Coordinator to acquire staff resources necessary to respond to cooling centers.

### b. DBH Deputy Directors, Program Managers, Clinic Supervisors:

- I) Notify the DBH Disaster Coordinator when a Stage 3 Heat Wave notification or activation has been received
- II) Insure staff are reminded of Medications of Concern (Page 13) and Injury Prevention (Page 14)

### c. SBC DBH Disaster Coordinator:

- I) Communicate activities with DBH Director when the Stage 3 Heat Wave Plan has been activated.
- II) Coordinate with the following agencies for information on heat wave projections/affected communities and available cooling stations:
  - County OES: 909-356-3998 (Miles Wagner)
  - Public Health: 909-387-6219 (Dr. Beed)
  - State Cooling Center Call 1-877-435-7021 Voice or 1-800-822-6268 TTY.
  - Red Cross (909) 888-1481
  - So Cal Edison 1-800-655-4555
  - OES, in partnership with the Franchise Tax Board, established the toll free number **1-877-435-7021** for concerned citizens to call to obtain heat related information, referral numbers for the impacted counties, as well as locations of open cooling centers. The hours of operation are 7 a.m. to 7 p.m. daily and will remain available until the severe heat has passed. Hearing impaired individuals may call via **TTY** at **1-800-822-6268**.

- III) Communicate Stage 3 alert to managers and department staff (and precautions to field staff and

transporters)

#### **d. DBH Staff**

- I) Take precautions to minimize heat-related injury to self and/or clients (Page 14)
- II) Be familiar with cooling station locations or contact information to locate centers
- III) Be watchful for unsafe conditions when making home visits, assist clients to access cooling stations
- IV) Carry information handouts on Heat-Related Emergencies (Pages 20 – 21)

### **3. COOLING SITE INFORMATION**

Additional information may be obtained from the State OES website:

COOLING SITES (by County)

<http://www.oes.ca.gov/Operational/OESHome.nsf/ALL/AA07C0C051F70991882572F3005C15CF?OpenDocument>

MARK UFFER Board of Supervisors  
County Administrative Officer BRAD MITZELFELT.....First District DENNIS HANSBERGER.....Third District  
PAUL BIANE.....Second District GARY C. OVITT.....Fourth District  
JOSIE GONZALES.....Fifth District

## DEPARTMENT OF PUBLIC HEALTH

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### COUNTY OF SAN BERNARDINO

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August 29, 2007

## HEAT ADVISORY

The San Bernardino County Department of Public Health has issued a heat warning for the period beginning August 29, 2007 through the weekend.

Temperatures are expected to exceed 105 degrees. We urge people, particularly the elderly, who are most susceptible to the heat to drink plenty of fluids, avoid overexertion and seek out air conditioned buildings to avoid overheating. There are a number of neighborhood cooling centers throughout the County where people can go to stay cool and avoid the heat. The center locations are listed below:

## COOLING CENTERS

**Bloomington Senior Center**  
**18317 Valley Boulevard**  
**Bloomington, CA**  
**(909) 877-4310**  
**M-F: 8 am-1:00 pm**

**Bloomington Branch Library**  
10145 Orchard Street  
Bloomington, CA 92316  
(909) 877-1453  
M-Tues: 12-8pm/Wed-Fri: 11-6pm/Sat: 11-5pm

**Chino Senior Center**  
13170 Central Avenue  
Chino, CA 91710  
(909) 591-9836  
8 am- 9 pm/7 days a week

**Montclair Senior Center**  
5111 Benito Street  
Montclair, CA 91763  
(909) 625-9462  
M-F: 8 am-5 pm

**Cypress Community Center**  
8380 Cypress Avenue  
Fontana, CA 92335  
(909) 428-8374  
M-F: 8am – 8 pm

**Don Day Community Center**  
14501 Live Oak Avenue  
Fontana, CA 92337  
(909) 822-2321  
M-F: 8-8 pm/Sat: 8-1pm

**George M. Gibson Senior Center**  
250 N. Third Avenue  
Upland, CA 91786  
(909) 981-4501  
M-F: 8:30 am-5pm/Sat: 8:30-12 pm

**Joslyn Senior Center**  
21 Grant Street  
Redlands, CA 92373  
(909) 798-7550  
M-F 8 am–5 pm

**Loma Linda Senior Center**  
25571 Barton Road  
Loma Linda, CA 92354  
(909) 799-2820



**Fontana Branch Library**  
16860 Valencia Avenue  
Fontana, CA 92335  
(909) 822-2321  
M-Tues: 12-8pm/Wed: 10-8pm/  
Th-Fri: 10-6pm/Sat: 9-5pm/Sun: 12-5pm

**Kaiser Branch**  
11155 Almond Avenue  
Fontana, CA 92337  
(909) 357-5900 X8029  
M-Th: 3-8 pm/Fri-Closed/Sat: 10-5 pm

**Summit Branch Library**  
15551 Summit Avenue  
Fontana, CA 92336  
(909) 357-5950 X3024  
M-Th: 3-8pm/Fri: Closed/Sat: 9-5pm

**Rialto Senior Center**  
1411 S. Riverside Avenue  
Rialto, CA 92376  
(909) 877-9706  
M-TH: 7-5 pm/Fri: 8-1 pm

**Carter Branch Library**  
2630 N. Linden Avenue  
Rialto, CA 92377  
(909) 854-4100 X28148  
M-Th: 12-8pm/Fri: Closed/Sat: 9-5pm

**Rialto Branch Library**  
251 West 1<sup>st</sup> Street  
Rialto, CA 92376  
(909) 875-0144  
M-Wed: 10-8 pm/Th-Fri 10-6pm/Sat: 10-5pm

**Barstow Senior Center**  
Nutrition Site  
555 Melissa Avenue  
Barstow, CA 92311  
(760) 256-5023  
M-Th: 9 am -3 pm/Fri: 9-1:30 pm

**Mentone Senior Center**  
1331 Opal Avenue  
Mentone, CA 92359  
(909) 794-5280  
M-Thurs: 9 am-pm/Fri: 10am-5pm/Sat: 9am-5pm

**Marygold Senior Center**  
16707 Marygold Avenue  
Fontana, CA 92335  
(909) 822-3246  
M-F: 8 am – 3 pm

**George White Senior Center**  
8565 Nuevo Avenue  
Fontana, CA 92335  
(909) 822-4493  
M-F: 8 am-1:00 pm

**Ontario Senior Center**  
225 E. "B" Street  
Ontario, CA 91764  
(909) 395-2021  
M-F: 8 am 8 pm

**James L. Brulte Senior Center**  
11200 Baseline Road  
Rancho Cucamonga, CA 91701  
(909) 477-2780  
M-F: 8 a.m.-10 pm/Sat 7am-6pm/Sun 7am-5pm

**Victorville Activity Center**  
15075 Hesperia Road  
Victorville, CA 92395  
(760) 245-7047  
10 am.- 1pm (lunch served 11:30)

**Victorville Senior Club**  
14874 Mojave Dr.  
Victorville, CA 92394  
(760) 245-5018  
M-F 9 am-4 pm

**Newberry Springs Senior Center**  
33386 Newberry Road  
P.O. Box 244  
Newberry Springs, CA 92356  
(760) 257-3284  
Tues-Sat: 7 am–2pm

San Bernardino County Fair – San Bernardino County  
14800 Seventh Street, Victorville, CA 92392

National Orange Show – San Bernardino County  
689 S. "E" Street, San Bernardino, CA 92408

**Yucca Valley Community Center**  
57090 Twenty-nine Palms, Hwy  
Yucca Valley, CA 92284  
M-F: 8 am – 5 pm

**Museum, Yucca Valley**  
Sat. & Sun: 10 am-4:00 pm  
**29 Palms Senior Center**  
6539 Adobe Road  
Twenty-nine Palms, CA 92277  
M-F: 9 am -5 pm  
If the temperature is over 115, Center is open  
Sat. & Sun.

**Hutton Community Center**  
660 Colton Avenue  
Colton, CA 92324  
M-F: 8-8 pm

**Perris Hill Senior Center**  
780 E. 21<sup>st</sup> Street  
San Bernardino, CA 92404  
M-F: 8-5 pm

**San Bernardino Senior Center**  
600 W. 5<sup>th</sup> Street  
San Bernardino, CA 92410  
M-F: 8-5 pm

**Hernandez Community Center**  
222 North Lugo  
San Bernardino, CA  
M-F: 9 am – 8 pm/Sat: 10 am – 4 pm

**Lytle Creek Community Center**  
380 So. "K" Street  
San Bernardino, CA 92410  
M-F: 9 am – 8 pm/Sat: 10 am – 4 pm

**Nicholson Community Center**  
2750 W. 2<sup>nd</sup> Street  
San Bernardino, CA 92410

## **b. DBH Field Teams and Office Staff:**

- Review Heat Related Illness by Regina Kane (June 23, 2006) on MH Net under QID.
- Have handouts in English and Spanish for the people you serve to hand out and to be available in your lobbies. See Medication and the Sun, the Heat posted at this site.
- Field staff, in the course of visiting individuals, should review living conditions ---who have working air conditioning, who have swamp coolers and who have no cooling available.
- Staff should review the locations and availability of cooling centers posted on the State OES Web Site.
- If when visiting customers at Board and Cares (B/C) or Room and Boards (R/B) there is a problem in cooling the facility, field staff should remind operator of their responsibility under licensing rules:

{ **Title 22 Section 80088** (a) comfortable temperature for clients shall be maintained at all times.

- (1) The licensee shall maintain the temperature in rooms that the clients occupy between a minimum of 68 degrees F (20 degrees C) and a maximum of 85 degrees F (30 degrees C).

(A) In areas of extreme heat the maximum shall be 30 degrees F (16.6 degrees C) less than the outside temperature. }

- Please provide information regarding the cooling centers as an alternative while the problem is being resolved. Notify your supervisor if you come across a problem with cooling at B/C or R/B.

## **4. OTHER AGENCY'S RESPONSIBILITIES:**

State agencies are also involved in a number of activities to protect the public and help local officials plan and prepare for the severe heat. This includes:

OES and CDPH are increasing efforts to inform the public of the forecasted high temperatures and steps individuals can take to protect themselves. More information can be found at [www.oes.ca.gov](http://www.oes.ca.gov) or [www.cdph.ca.gov](http://www.cdph.ca.gov) .

- The California Department of Social Services and the Department of Mental Health are working with their licensed facilities to ensure they are prepared for the severe heat and able to respond to any facility emergencies.
- OES will also be coordinating daily meetings between the National Weather Service, State and local government agencies to coordinate response to the high temperatures.
- OES will be prepared to activate its Regional Emergency Operations Centers and State Operations Centers in the event of any heat-related emergencies.

- Cal/OSHA will actively enforce the heat illness prevention regulations making sure employers are complying. Cal/OSHA is also actively working to inform employees and employer groups about ways to prevent heat illness and be safe in their outdoor work environments during times of extreme heat. For more information, please visit our website at [www.dir.ca.gov/heatillness](http://www.dir.ca.gov/heatillness)
- The Department of Developmental Services will forward information to affected regional centers and state developmental centers with the heat alert and shared tips from the California Department of Public Health, Center for Disease Control, and Department of Social Services regarding how to safeguard from heat related injuries and illnesses. Affected developmental centers should be prepared to curtail outside activities to reduce the potential for injuries and illnesses and regional centers are keeping their providers and others informed of the potential for negative impact on people with developmental disabilities in these areas. Each impacted regional center will be provided the location of cooling centers in their areas and DDS will post tips for avoiding heat related injuries and illnesses on its public website. DDS will continue to monitor the situation and provide information as it becomes available.
- The Department of Mental Health will activate the department's contingency plan for excessive heat emergencies. Specific activities are:
  - DMH e-mail notification to the County Mental Health Directors of the affected counties to include the location of cooling centers, standard cooling tips, a request that the mental health programs provide appropriate assistance to facilities under their jurisdiction, information about the toll free 800 line to be activated by the Office of Emergency Services, and a link to the OES Heat Preparedness Website
  - Notification to DMH-licensed facilities in the impacted counties to ensure they are aware of the heat alert and have access to all relevant heat preparedness information.
  - Participation in daily conference calls with the OES
- The Department of Public Health will disseminate information specific to the health alert event via a California Health Alert Network (CAHAN) alert to local health departments directing them to activate their local plans. The department will also:
  - Started collecting local health related information.
  - Posted heat tips and its report of 2007 heat deaths.
  - Begin monitoring long-term care facilities and skilled nursing facilities, and intermediate care facilities.
  - Activated the Joint Emergency Operations Center.

The Department of Rehabilitation (DOR) staff will be notified of the situation and will participate on teleconferences and advise OES on issues specific to people with disabilities. Areas of advisement will

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include the accessibility of cooling centers, transportation and communication. DOR will place the list of cooling centers on its website. Department leaders will work with the external affairs of OES and California Independent System Operator (CAISO) to ensure messages are consistent to people with disabilities and better explain who should be utilizing air conditioning.

## **5. MEDICATIONS OF CONCERN IN HOT WEATHER:**

### **Antipsychotics: (newer ones indicated by \*)**

Abilify (Aripiprazole)\*  
Prolixin (Fluphenazine)  
Clozaril (Clozapine)\*  
Risperdal (Risperidone)\*  
Geodon (Ziprasidone)\*  
Serentil (Mesoridazine)  
Haldol (Haloperidol)  
Seroquel (Quetiapine)\*  
Loxitane (Loxapine)  
Stelazine (Trifluoperazine)  
Mellaril (Thioridazine)  
Thorazine (Chlorpromazine)  
Moban (Molindone)  
Trilafon (Perphenazine)  
Navane (Thiothixene)  
Zyprexa (Olanzapine)\*

### **Tricyclic antidepressants:**

Anafranil (clomipramine)  
Elavil (Amitriptyline)  
Norpramin (Desipramine)  
Pamelor (Nortriptyline)  
Sinequan (Doxepin)  
Surmontil (Trimipramine)  
Tofranil (Imipramine)  
Vivactil (Protriptyline)

### **Antiparkinson/antihistamine:**

Artane (trihexyphenidyl)  
Atarax or Vistaril (hydroxyzine)  
Benadryl (diphenhydramine)  
Cogentin (benztropine)  
Lithium (includes Lithobid, Eskalith CR)

There is particular concern about the antipsychotic as a group and more indication that the older ("typical" or 1st generation) antipsychotic have contributed to heat stroke and deaths as compared to the newer ones. Of course, the older antipsychotic have been around much longer and perhaps overused in the past. However, a theoretical concern is still there with the newer ones (such as Risperdal). There

have also been cases of deaths with a question of the contribution of excessive heat with the combination of Lithium and antipsychotic. As you may know we use this combination often but there is a concern of potential greater risks.

Treatment with Lithium is of concern if a person is not adequately hydrated and excessively sweating with the resulting possibility of lithium toxicity.

Use of medications with anticholinergic properties can decrease sweating therefore interfering with the body's cooling mechanism. In psychiatry these include tricyclic antidepressants, antiparkinson meds such as Cogentin and Artane and antihistamines such as Benadryl.

Any sedating medication (for example antipsychotic, sedating mood stabilizers, sedating antidepressants, and antianxiety meds) could put a person at greater risk due to possible lack of awareness of becoming overheated and taking appropriate action. The same issue is of concern with drugs of abuse (heroin, MJ, alcohol) which are sedating.

Other drugs of abuse such as methamphetamine or cocaine could also pose a risk and deaths due to overheating have been known to happen with Ecstasy.

Medical conditions such as cardiovascular or respiratory disorders also can put someone at greater risk.

Remotely related is the phenomena of photo toxicity whereby taking a medication can make the person more sensitive to the sun resulting in an exaggerated sunburn - Thorazine is probably the most likely of psych meds to cause this problem but it has been rarely reported with other psych meds.

The following article is a good review – although a bit old (1998):

<http://www.aafp.org/afp/980901ap/barrow.html>

## 6. SYMPTOMS, PREVENTION & TREATMENT

To avoid heat exhaustion, heat stroke and other heat-related complications, state officials recommended that Californians:

- Create a cooler environment by making sure that window air conditioners are installed snugly, making sure that window air conditioners and air conditioning ducts are properly insulated, weather stripping doors and sills, and placing window reflectors made of cardboard covered with aluminum foil between windows and drapes.
  - Drink plenty of water, especially when taking medication.
  - Wear lightweight and light-colored clothing.
  - Avoid physical activities during periods of peak temperatures.
  - Check-on neighbors and family members to ensure they are not being harmed by the heat.
- 
- Watch for signs of heat-related illness, including fatigue, nausea, headache and vomiting.
  - Visit malls, theaters and other public places that are air-conditioned if they don't have their own air conditioning.

### **Types of Heat-Related Illness Heat Edema**

Heat edema, the mildest form of heat-related illness, occurs when swelling develops in dependent areas of unacclimatized persons during hot summer months. This disorder is caused by transient peripheral vasodilation from the heat and orthostatic pooling during prolonged sitting or standing. Heat edema may improve with periodic exercise or elevation of the legs.<sup>2</sup>

### **Heat Cramps**

Heat cramps are painful spasms of skeletal muscles of the arms, legs or abdomen.<sup>3</sup> Predisposing factors include lack of acclimatization, a negative sodium balance and use of diuretic medications. Heat cramps may be a warning sign of impending heat exhaustion.<sup>9</sup> Treatment consists of oral or parenteral sodium replacement. Most athletes and adolescents will obtain enough sodium through natural cravings for salty foods (e.g., pretzels, chips). An oral rehydration solution can be made using one teaspoon of table salt per one quart of water.<sup>9</sup>

### **Heat Syncope**

Heat syncope presents as an orthostatic syncopal episode or dizziness that usually occurs with prolonged standing or sudden rising from a sitting or lying position.<sup>3</sup> Predisposing factors include exercise without a cool-down period, dehydration and lack of acclimatization.<sup>9</sup> Heat syncope can result from inadequate cardiac output and postural hypotension.<sup>12</sup> Recovery is immediate once the patient falls to the ground. Treatment consists of placing the patient in a supine position and replacing any water deficit. In severe cases, the patient's consciousness may be altered. Heat syncope can be avoided by having the patient sit or lie down when premonitory symptoms of lightheadedness and weakness are experienced.



## Heat Exhaustion

Heat exhaustion occurs when a person experiences excess sweating in a hot humid environment, causing volume depletion. Core body temperature may rise above 38.0°C (100.4°F) but lower than 40.5°C (104.9°F). Symptoms include profuse sweating, malaise, headache, dizziness, anorexia, nausea, vomiting, vertigo, chills, muscle or general weakness, tachycardia and hypotension, visual disturbances and cutaneous flushing. Major neurologic impairment is absent.<sup>2,13,14</sup>

Symptomatic patients should be moved to a cool area to rest.<sup>2,9,13</sup> Oral rehydration (approximately 1 L [2.1 pt] per hour for several hours) is preferred in patients who are coherent and without gastrointestinal symptoms. Elevation of the legs can reduce postural hypotension. Recovery should be rapid and the patient should feel better in two to three hours. If recovery is not progressing, the patient may need additional intervention such as more intensive cooling or intravenous rehydration.<sup>12,13</sup> Dextrose in half-normal or normal saline is the most commonly used intravenous rehydration solution in patients with heat exhaustion.

## Heat Stroke

Heat stroke is characterized by a core body temperature of at least 40.5°C (104.9°F) and acute mental status changes. Heat stroke occurs when heat production exceeds heat dissipation. The mortality rate in patients with heat stroke may be as high as 10 percent.<sup>1</sup> The resultant hyperthermia causes damage to tissues in multiple organ systems.<sup>13</sup> Endotoxins and cytokines may play a significant role in the progression and severity of hyperthermia.<sup>14</sup> Predisposing factors include the risk factors for heat exhaustion as well as genetic predisposition. Heat stroke may be divided into two types, exertional and classic heat stroke<sup>2</sup> (*Table 3<sup>5,8,15</sup>*). The more severe and prolonged the episode, the worse the predicted outcome, especially when effective cooling measures are delayed. Heat stroke is a true medical emergency. The diagnosis is made when a markedly elevated temperature and changes in mental status follow heat exposure. The differential diagnosis includes hyperthyroid storm, pheochromocytoma, central nervous system injury, infection, anticholinergic poisoning, drug ingestion and neuroleptic malignant syndrome.

## Evaluation of Heat Stroke History

It is important to obtain a history of the symptoms and the preceding circumstances.<sup>6</sup> A description of the neurologic changes may be obtained from family, friends or bystanders. Premonitory symptoms such as weakness and dizziness often may go unrecognized,<sup>16</sup> and patients frequently present acutely with collapse.<sup>3</sup> It is critical to review the patient's medical history, medication history and history of illicit drug use, as well as treatment administered before and during initial medical intervention.

## Physical Examination

Patients may be tachycardic, tachypneic, hypotensive or normotensive at initial evaluation.<sup>6</sup> Core body temperature should be obtained with a rectal, esophageal or bladder probe.<sup>2</sup> Tympanic, oral or axillary temperatures are not accurate for the measurement of core temperature. Temperature may be lower if cooling has been started en route to the emergency department.<sup>5</sup> The thermometer used must be able to register above 41.0°C (105.8°F).

The skin may be hot and dry, especially in cases of classic heat stroke. The neurologic examination may reveal irritability, confusion and ataxia. Seizures may or may not be present initially but may occur during cooling. Coma may be the most common presentation, and decorticate posturing may be present. Severe volume depletion and peripheral vasoconstriction will be present. Hypotension decreases perfusion as heat stroke progresses. The onset of coagulopathy, which may progress to disseminated intravascular coagulation (DIC), may be

signaled by ecchymosis, hematemesis, hematuria and epistaxis. The laboratory work-up is summarized in *Table 4*.<sup>2,6,16</sup>

### **Treatment Considerations in Heat Stroke External Cooling**

Rapid cooling to bring the patient's core temperature to 38.8°C (101.8°F) is a critical factor in improving prognosis. There is controversy regarding which cooling techniques are most effective. Evaporative and immersion methods of cooling, or a combination of these methods, have been demonstrated to be useful.<sup>2,6,13,17,18</sup>

Evaporative methods require removal of restrictive or unnecessary clothing, spraying the patient with water or wrapping the patient in wet towels or sheets, and increasing air flow over the patient. This method can be readily available in the field and does not interfere with other aspects of resuscitation. Vasoconstriction and shivering are less frequently associated with evaporative methods than with immersion methods.<sup>2,6,17</sup>

Immersion methods are effective but may be difficult to arrange and may delay cooling. They involve the use of ice baths, a cooling blanket, ice packs to the axillae, groin and neck, and cool or cold water immersion. The resultant hypothermic vasoconstriction of cutaneous blood vessels may increase blood pressure in hypotensive patients. It can, however, diminish peripheral circulation and retard heat loss. Shivering can also occur, generating body heat and impeding cooling efforts. Diazepam (Valium) and neuroleptic agents such as chlorpromazine (Thorazine) can inhibit shivering.<sup>2,6,18</sup> Immersion limits access to the patient for resuscitation in the event of cardiac arrest and precludes the use of electrocardiographic (EKG) monitoring, causes vagal stimulation and may cause bradycardia.<sup>2</sup>

### **Internal Cooling**

Internal methods for cooling patients may be used for treatment of hyperthermia when external methods have not been effective. Cold water irrigation to the stomach or rectum, peritoneal lavage and cardiopulmonary bypass should only be used in addition to external cooling methods.<sup>2</sup>

### **Other Management Considerations**

Respiratory and cardiac status must be evaluated and closely monitored. Oxygen supplementation and intubation should be provided if respiratory assistance is indicated. Intravenous access should be obtained for the administration of fluids (usually dextrose plus normal or half-normal saline) and medication. A fluid challenge should be provided if the patient is hypotensive. Urine output should be monitored.<sup>2,6</sup>

### **Complications and Prognosis of Heat Stroke**

Complications of heat stroke include damage to the central nervous system, liver injury with associated jaundice and coagulopathy, rhabdomyolysis with myoglobinuria and renal injury, and cardiac abnormality with arrhythmia, myocardial infarction, and pulmonary edema (*Table 5*).<sup>2,3,5,7,9,11,16,19-21</sup>

Hepatic damage is very common and is thought to be related to DIC. Renal failure can occur and is due to severe rhabdomyolysis. Serum and urine myoglobin levels may be normal initially; therefore, it is important to follow these levels serially. Renal failure is a result of deposits of myoglobin within the renal tubules.<sup>19</sup>

Prognosis can be assessed by several indicators (*Table 6*).<sup>5,16,17,20,22</sup> Complete recovery can take from two months to as long as one year,<sup>16</sup> depending on severity of injury.

## Prevention of Heat-Related Illness

Prevention remains the cornerstone of therapy.<sup>21</sup> As the number of people participating in athletic activities increases and as the intensity and duration of events increase, an increase in heat-related illnesses may be expected.<sup>11</sup> Environmental conditions contribute to heat injury, but an awareness of other predisposing factors can assist in decreasing the number of adverse events. This would include observance of atmospheric conditions, use of proper clothing, timing of workouts and attention to the hydration status of the participants. Persons who may be at risk should be identified in order to prevent heat-related illness (*Tables 1 and 2*).

## Environment

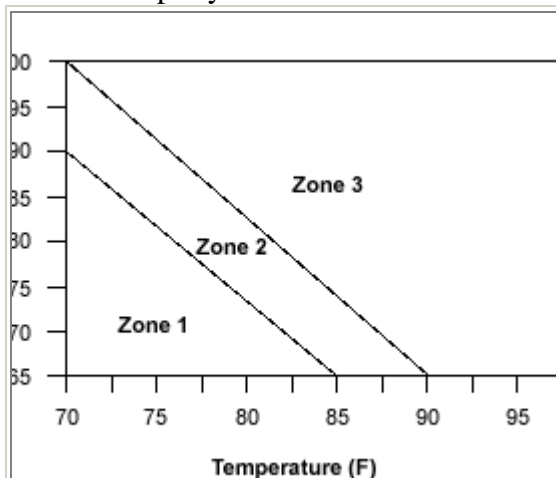
The vast majority of heat-related problems are a direct result of the environmental conditions in which the athlete has been exercising. Accurate assessment of these conditions coupled with a working knowledge of heat stress charts may be extremely beneficial in evaluating the risk of heat injury as a result of environmental conditions. Wet bulb globe temperatures are helpful, and information on obtaining such temperatures is often found in sports medicine texts.<sup>9</sup> The actual risk of heat injury related to environmental conditions can be predicted using the heat stress danger chart in *Figure 1*.

## Acclimatization

The process of becoming accustomed to exercise in the heat is known as acclimatization. Essentially, the body learns to work more efficiently in hot weather with less generation of its own internal heat. This acclimatization process is an essential part of preventing heat-related illnesses.<sup>11</sup>

Repeated episodes of exercise in the heat facilitate the acclimatization process.<sup>13</sup> Adults require four to seven sessions of one to four hours each in the heat. Children require slightly longer.<sup>9,10</sup> Such acclimatization is best done during the heat of the day and is facilitated by continual replacement of wet clothing with dry garments.

This improvement in the body's efficiency is accomplished by the training effect (improved level of physical condition, which allows for increased exercise capacity in the heat, improved heat dissipation and changes in metabolism). The more efficient heat dissipation mechanism is largely due to an increase in sweat production for a given increase in core temperature. This process will occur more rapidly in a conditioned athlete.<sup>10</sup>



. Heat stress danger chart. Zone 1: Fairly safe environmental conditions. Routine precautions. Zone 2: Moderate-risk environmental conditions.

is should include less-intense, shorter workouts, with more breaks and increased fluid intake. Persons at increased risk should be carefully observed. High-risk environmental conditions. Precautions should include rescheduling workouts for cooler times of the day. Workouts should be less intense. Participants should wear light clothing and minimal equipment, drink extra fluids and monitor for early symptoms of heat injury.

## Hydration

Adequate fluid status is important for the prevention of heat illness. Fluids must be consumed before the urge for them rises, since a substantial amount of dehydration can occur before stimulation of the thirst mechanism occurs. Pre- and post-heat exposure weights should be checked, and for each pound of weight lost, the athlete should consume 448 g (16 oz) of fluid. In an effort to obtain and maintain an adequate fluid balance, prehydration is important and must be continuously emphasized. Prehydration provides a fluid "cushion" and delays the onset of dehydration. Dehydration is generally not a problem in exertion lasting less than 20 to 60 minutes.

Proper hydration involves ingestion of up to 448 g (16 oz) of fluid before the exercise. The athlete should then continue to drink 224 g (8 oz) of fluid every 20 minutes during the activity, with a goal of not experiencing thirst during training and voiding light yellow urine at least four times daily. The fluid can be something as simple as water or may be a flavored drink. Flavored drinks can contain sugar, which should not be very high in concentration. Examples of acceptable, widely available products include Gatorade Frost Thirst Quencher (14 g of sugar per 240 mL [about 8 oz]) and Allsport Body Quencher (19 g of sugar per 240 mL [about 8 oz]). By way of comparison, a standard 240-mL (8-oz) serving of soda contains 26 to 31 g of sugar.

## 7. Heat-Injury Handout

E M E R G E N C Y   S U R V I V A L   P R O G R A M

# ESP FOCUS

## Heat Wave



### It can get too hot!

During an average summer, some 200 people across the country die due to heat injuries from exposure to high summer temperatures.

Clearly, heat can be a force, particularly in Southern California, where temperatures exceeding 100 degrees in the suburban valleys and 110 degrees in the low desert areas are not uncommon during the summer and fall.

Heat-wave emergencies can strike very quickly. In 1995, for example, the city of Chicago's medical examiner received reports regarding the first heat-related fatalities at 9 p.m. on a Friday night. By 8 a.m. the following morning, an additional 87 people had died. These deaths were caused directly by the heat.

Exposure to sunlight is a mixed blessing. Although sun is necessary for life, exposure to ultraviolet (UV) radiation is potentially dangerous and can damage the skin. Varied burns result from prolonged exposure to UV rays, but some people also may burn from very little exposure. UV rays can significantly keep the skin from compensating for the excess heat.

Overexposure to heat or excessive exercise in the heat also can cause other injuries. The severity of such injuries increases with age; heat cramps in a younger person may be heat exhaustion in a middle-aged person, but may be heatstroke in an elderly person. This occurs because the person has not adapted to the heat and is unable to adjust to changes in the body.

The reverse side of this *Focus Sheet* offers recommendations designed to help you avoid heat-related death and injury wherever you live, work, or play.



# AUGUST

[www.espfocus.org](http://www.espfocus.org)

## Heat Conditions, Symptoms and First Aid

### What you might see in a heat injury

1. Sunburn is usually a first-degree burn that involves just the outer surface of the skin. Symptoms include redness and pain. Severe cases may cause swelling, blisters, fever of 102 degrees or above and headaches.

**First Aid:** Use ointments, as well as cool baths or compresses, for less severe cases. Don't break the blisters; if blisters do break, use a dry germ-free dressing. In severe cases consult a physician. Drink plenty of water.

2. Heat cramps often are related to dehydration. Symptoms include increased sweating with painful muscle spasms of the arms, legs and occasionally the abdomen.

**First Aid:** Remove the victim from the hot environment. Apply pressure on or gently massage the spastic muscles to relieve spasms.

3. Heat exhaustion is the inability to sweat enough to cool yourself. Symptoms include fatigue, weakness, dizziness, nausea or vomiting as well as cold, clammy, pale, red or flushed skin. A marked body temperature rise will not occur.

**First Aid:** Remove the victim from the heat. Lay the victim down and loosen the clothing. Apply cold compresses and cool the body by fanning the victim or placing the victim in a cool environment. Consult a physician if vomiting continues.

4. Heatstroke occurs when the body stops sweating but the body temperature continues to rise. Symptoms include visual disturbances, headache, nausea, vomiting, confusion and, as the condition progresses, delirium or unconsciousness. The skin will be hot, dry, red or flushed even under the armpits. This condition is a severe medical emergency that could be fatal.

**First Aid:** Consult a physician immediately or call 9-1-1. Remove clothing and place victim in a cool environment, sponge the body with cool water or place the victim in a cool bath. Continue the process until temperature decreases. DO NOT PROVIDE FLUIDS to an unconscious victim.



## Preventing Heat Injuries

### What you can do to prevent heat injuries

- ☐ Avoid the sun from 10:00 a.m. to 3:00 p.m. when the burning rays are strongest.
- ☐ Reduce physical activity.
- ☐ Wear a wide-brimmed hat and light colored, lightweight, loose-fitting clothes when you're outdoors. This type of clothing reflects heat and sunlight, which helps you maintain a normal body temperature.
- ☐ Avoid sudden changes of temperatures, (i.e., air out a hot car before getting into it).
- ☐ Avoid hot, heavy meals that include proteins. They increase your metabolism and water loss, and raise your body's natural way of cooling.
- ☐ Set your air conditioning thermostat between 75 and 80 degrees. If you don't have an air conditioner, take a cool bath or shower twice a day and visit air-conditioned public spaces during the hottest hours of the day.
- ☐ Drink plenty of fluids even if you aren't thirsty. Eight to 10 glasses of water a day are recommended. Drink even more if you are exercising or working in hot weather.
- ☐ Do not drink alcohol or caffeine since they are diuretics (i.e., promote water loss).
- ☐ Use a sunscreen with a sun protection factor (SPF) of at least 15 if you need to go out in the sun.

*Extracted and adapted from "Heat Illness Prevention," American College of Sports Medicine, Indianapolis, IN.*

During a heat wave keep yourself cool at air-conditioned facilities like public libraries, malls, or community centers and check with your local Public Health Department for "cooling centers" in your community.



This Focus Sheet is produced as part of the Emergency Survival Program (ESP). ESP is an awareness campaign designed to increase home, neighborhood, business and school emergency preparedness. ESP was developed by the County of Los Angeles. The California Governor's Office of Emergency Services (OES) and representatives from Contra Costa, Imperial, Inyo, Kern, Los Angeles, Marin, Mono, Orange, Riverside, San Bernardino, San Diego, San Luis Obispo, Santa Barbara, Santa Cruz, and Ventura counties; Southern California Edison; the Southern California Earthquake Center and the American Red Cross assist in the development of campaign materials and coordination of the campaign.



## 8. HEAT-RELATED ARTICLE & SOURCES

### Heat-Related Illnesses

MICHAEL W. BARROW, M.D., and  
KATHERINE A. CLARK, D.O. Wright  
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Heat-related illnesses cause 240 deaths annually. Although common in athletes, heat-related illnesses also affect the elderly, persons with predisposing medical conditions and those taking a variety of medications. Symptoms range from mild weakness, dizziness and fatigue in cases of heat edema, to syncope, exhaustion and multisystem complications, including coma and death, in cases of heat stroke. Milder heat-related symptoms can be treated with hydration, rest and removal from the hot environment. Heat stroke, a life-threatening problem, must be treated emergently. Prompt recognition is critical since rapid cooling is the cornerstone of treatment and must not be delayed. Fluid resuscitation with dextrose and normal or half-normal saline is also important. These therapies should be instituted while the patient is being stabilized. Heat illness may be prevented by recognizing which individuals are at risk, using appropriate hydration and paying attention to acclimatization and environmental conditions. Preventive care should include drinking plenty of fluids before, during and after activities, gradually increasing the time spent working in the heat and avoiding exertion during the hottest part of the day.

Although heat-related illnesses are treatable and preventable,<sup>1-3</sup> at least 240 persons die of heat-related illnesses in the United States each year.<sup>1</sup> In 1980, 1,700 persons died during a prolonged heat wave.<sup>1</sup> Heat stroke is ranked third behind head and neck trauma and cardiac disorders as a cause of death among U.S. high school athletes.<sup>2</sup> In 1995, five high school students died of heat-related illnesses.<sup>3</sup> The mortality from heat-related illness is probably under-reported because deaths related to cardiovascular, cerebrovascular and respiratory disorders occur during heat waves.

### **Etiology, Risk Factors and Pathophysiology**

Heat-related illnesses are more common in the summer but can also occur in moderate conditions, depending on environmental factors. Heat production is affected by multiple environmental factors including temperature, humidity, sun exposure, wind and clothing. The body's thermoregulatory system is responsible for allowing the body to heat and cool itself as necessary. This system can be overwhelmed during periods of heat stress if the sum of the environmental heat load and the metabolic heat load exceeds the body's capacity for heat dissipation.<sup>4</sup>

Most heat-related problems result from environmental conditions and can be predicted and prevented.

Dehydration of more than 3 percent of body weight is an important risk factor in heat-related illnesses.<sup>5</sup> In addition, if lost fluids are not restored, the risk of heat-related illness is higher. These losses can be exacerbated by utilization of replacement fluids that are diuretic (i.e., beverages

containing caffeine or alcohol). Thirst cannot be relied on as a measure of fluid loss, since athletes may not become thirsty until they are 5 percent dehydrated.<sup>6</sup>

A variety of medical conditions as well as physiologic conditions, medications and abused substances can contribute to a person's risk for heat-related illness. These conditions are summarized in *Tables 1 and 2*.<sup>2-11</sup>

**TABLE 1**  
Conditions Contributing to the Risk of Heat-Related Illness

<b>Physical conditions</b>	<b>Increased body mass</b>
Fever	More heat generated for same level of activity
Dehydration	Less efficient heat dissipation
Medications ( <i>see Table 2</i> )	Fewer heat-activated sweat glands in skin overlying adipose tissue
Prolonged exertion	Decreased cardiac output per unit of body weight
Chronic illnesses	
Cardiac conditions	<b>Younger age</b>
Cystic fibrosis	Decreased ability to sweat
Uncontrolled diabetes	Decreased cardiac output at a given metabolic rate
Uncontrolled hypertension	Greater core temperature required to initiate sweating
Eating disorders	Slower acclimatization
Malignant hyperthermia	More heat produced for the same level of activity
Peripheral vascular disease	
Extensive skin disease or damage, or both	<b>Additional factors</b>
Autonomic nervous system disorders	Lack of access to air conditioning
Psychiatric conditions	Residing in upper floors in tall buildings
Hyperthyroidism	Sleep deprivation (decreases skin blood flow and rate of sweating)
	Previous heat stroke
<b>Older age</b>	Use of equipment or heavy clothing (football player's pads, firefighter's protective gear, etc.)
Decreased vasodilatory response	Recent move from a temperate to a hot climate
Decreased maximum heart rate, resulting in decreased maximum cardiac output	Urban setting
Decreased thirst response	
Decreased fitness level	
Decreased mobility resulting in increased difficulty of easily obtaining fluids	

Information from references 2 through 11.



**TABLE 2**

Medications Contributing to the Risk of Heat Illnesses

Alpha agonists	Heroin
Amphetamines	Inhaled anesthetics
Anticholinergic medications	Laxatives
Antihistamines	LSD
Anti-parkinsonian agents	Monoamine oxidase inhibitors
Beta-adrenergic blockers	PCP
Calcium channel blockers	Phenothiazines
Cocaine	Sympathomimetic medications
Diuretics	Thyroid agonists
Ethanol	Tricyclic antidepressants

LSD=lysergic acid diethylamide; PCP=phencyclidine hydrochloride.

Information from references 2 through 11.

It is important to recognize that the collapse of an athlete during exercise does not necessarily indicate heat-related illness. While a heat-related illness must be considered in the differential diagnosis, a variety of other etiologies must also be considered.<sup>12</sup>

The heat load increases greatly during exercise. Twenty times more energy is produced at maximal activity, 75 percent of which is converted to heat rather than to work.<sup>9</sup> Heat dissipation occurs by central and peripheral mechanisms, through radiation, conduction, convection and evaporation.

Increases in core temperature stimulate vasodilation and sweating. Vasodilation contributes to heat loss by convection. However, vasodilation may decrease blood pressure if cardiac output cannot increase enough to normalize blood pressure. Peripheral vascular resistance will increase, improving blood pressure but worsening attempts at heat loss. Sweating causes heat loss by evaporation.<sup>4</sup> A small amount of the heat produced by muscle tissue is transferred passively by conduction to the tissue of the overlying skin. Some heat may be dissipated by convection via superficial veins en route to the heart.

Central mechanisms of heat dissipation, however, play a far more important role than peripheral means. Most heat is transported by blood from working muscles to the vena cava and then to the heart. Blood has a high heat capacity and can transport large amounts of heat with only a moderate increase in temperature. Heat is then dissipated by increased blood flow to the skin.<sup>6,9</sup> Radiation and conduction dissipate most of the heat when ambient temperatures are less than 20°C (68°F). Evaporation becomes more important in ambient temperatures greater than 20°C (68°F). During strenuous exercise, 85 percent of heat loss occurs by evaporation. A 70-kg (154-

lb) athlete will lose 1 to 2 L (2.1 to 4.2 pt) of sweat per hour during exercise. As ambient temperature and humidity increase, heat dissipation is less efficient. Elevated humidity decreases the evaporation of sweat. High ambient temperatures can cause heat gain through radiation.<sup>9</sup>

Each year members of a different medical faculty prepare articles for "Practical Therapeutics." This series is coordinated by the Department of Family Medicine at Wright State University School of Medicine, Dayton, Ohio. Guest editors of the series are Cynthia G. Olsen, M.D., and Gordon S. Walbroehl, M.D.

The authors thank Gordon Walbroehl, M.D., Nancy Snow, Mary Rose Pflug, Connie Henninger and Sheila Copeland for assistance in the review and preparation of the manuscript.

Figure 1 adapted with permission from Mellion MB, Walsh M, Shelton GL. The team physician's handbook. 2d ed. Philadelphia: Hanley & Belfus, 1997:161.

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## Heat Related Illness

By Regina Kane

Jun 23, 2006, 13:26

## HEAT RELATED ILLNESS

The temperature in Bakersfield is getting into 100-108 range. It's time to take health precautions to avoid heat exhaustion, heat stroke and overexposure to the sun. The people most likely to develop heat exhaustion and heat stroke are people with chronic illnesses, seniors and children.

### RISK FACTORS:

- Age young children (infancy to age four) and older persons(age 50+)

- Body size (low weight or obesity)
- Chronic Medical Conditions:
  - Heart disease, high blood pressure
  - Eating disorders
  - Hyperthyroidism
  - Kidney disease
  - Lung disease
  - Poor circulation
  - Previous heat stroke
  - Uncontrolled diabetes
  - Skin disease or damage, sunburn
  - Any illness that causes general weakness or fever

## **ACUTE CONDITIONS**

- Dehydration
  - Fever
  - Prolonged exertion
  - Increased agitation and psychomotor activity
- Alcoholism
- Drug abuse (Amphetamines, cocaine, heroin, LSD, PCP, Ecstasy)

Other related factors are lack of air conditioning and proper ventilation for heat and humidity. Persons who live on upper floors of buildings in the city are at risk.

Our individuals served have many of the above risk factors for heat exhaustion and heat stroke. But everyone is at risk and should be aware of the early signs and what precautions to take. The very first sign is weakness with lightheadedness. It can be accompanied by nausea and vomiting. These symptoms are caused by dehydration, and a loss of electrolytes, such as sodium. Electrolytes are minerals present in small amounts in the body to help with fluid balance and organ function.

The best way to prevent heat exhaustion and heat stroke is to stay hydrated.

**DRINK WATER**

And take extra salt (if you are not restricted by your doctor).

## **SYMPTOMS OF HEAT EXHAUSTION**

- Body temperature usually normal or only slightly elevated
- Dry mouth
- Fatigue, weakness
- Dizziness
- Headache

- Nausea, sometimes vomiting
- Weak and rapid pulse
- Sweating
- Cool, clammy, pale skin

## **TREATMENTS**

- Get out of the sun into a cool place
- Drink fluids, Gatorade or other sports drinks, but don't drink too fast or
- you could become sick
- Eat salty snacks
- Rest
- Loosen clothing

Heat stroke can come after heat exhaustion, but it can develop quickly on its own if the body temperature rises too high. Symptoms can come on quickly. Heat stroke can occur within 10-15 minutes of the first symptoms. If treatment is not given immediately, permanent damage can occur to the internal organs.

## **HEAT STROKE IS A MEDICAL EMERGENCY. CALL 9-1-1 OR TRANSPORT TO A HOSPITAL IMMEDIATELY**

## **SYMPTOMS OF HEAT STROKE**

- Very high body temperature, 103 or higher
- Hot, dry, red skin
- No sweating
- Disorientation, hallucinations, delirium
- Rapid breathing and fast pulse, then slow breathing and weak pulse
- Convulsions
- Loss of consciousness

## **IMMEDIATE CARE OF A PERSON WITH HEAT STROKE**

Move person to a cool place indoors, or in the shade outdoors  
Lower the body temperature by removing their clothing and wrapping them in a wet sheet or wetting their clothing fan the person with an electric fan or manually place ice packs or cold compresses on the neck, under the armpits, and in the groin area.

## **SUN EXPOSURE**

Exposure to too much sun can cause a severe sunburn at first and over time skin cancer, excessive wrinkling of the skin, cataracts and can cause the immune system to quit working. Individuals served who are on phenothiazines, Mellaril and Thorazine need to be especially careful in the sun. It is best to use a sunscreen lotion of at least sun protection factor (SPF) 15 to exposed areas. Also recommended is to wear a hat, sunglasses and long sleeved shirts. If possible avoid sun exposure at the hottest time of the day, 10AM to 4PM.